Matrix: Jurnal Manajemen Teknologi dan Informatika
Volume 14 Issue 1 Year 2024 Pages 1-8
DOI: http://dx.doi.org/10.31940/matrix.v14i1.1-8
URL: http://ojs2.pnb.ac.id/index.php/matrix

System Usability Scale (SUS) implementation in Ruang Baca Virtual – UT Library

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Abstract: Universitas Terbuka (UT) implements Distance Learning and since 2012 launched Ruang Baca Virtual (RBV) application to improve student learning services and provide alternative conveniences for students to utilize teaching materials online and help other universities wish to carry out online learning as an alternative solution to face-to-face replacement lecture services. Usability is one of the key factors for successful technology adoption. During the implementation of RBV, usability testing has never been carried out. The purpose of this study was to determine student perceptions of RBV usability. RBV usability testing was carried out using the questionnaire method using the system usability scale (SUS) instrument. The test results show that a SUS score of 72,66 placing RBV in the "acceptable" range, corresponds to a grade of C and the usability of RBV can be rated as "Good".

Keywords: usability testing, System Usability Scale (SUS), Ruang Baca Virtual (RBV)

History Article: Submitted 05 August 2023 | Revised 16 March 2024 | Accepted 03 April 2024

How to Cite: S. R. Arifin, "System Usability Scale (SUS) implementation in Ruang Baca Virtual – UT Library", *Matrix: Jurnal Manajemen Teknologi dan Informatika*, vol. 14, no. 1, pp. 1-8, 2024.

Introduction

Universitas Terbuka (UT) as a tertiary institution that implements Distance Learning, since 2012 launched Ruang Baca Virtual (RBV) application which can be accessed at https://pustaka.ut.ac.id/lib/ruangbaca/ as a form service provided by UT to improve student learning services and provide alternative conveniences for students to utilize teaching materials online [1]. RBV provides teaching materials for 1,350 courses and currently RBV can be accessed in full text in connection with efforts to increase awareness and prevention of contracting COVID-19 and as part of UT's commitment to assisting State Universities and private universities that wish to implement online learning as an alternative solution to face-to-face replacement lecture services.

RBV is introduced with innovative technical features to address the special challenges of providing distance learning. In contrast to conventional digital library systems, RBV incorporates personalization algorithms that dynamically suggest learning materials based on students' preferences and usage patterns. In addition, RBV adopts a micro-service architecture that allows for easier system scale and updates and provides a customizable interface to facilitate accessibility for users with special needs.

Nurdiansyah et al [2] previously conducted research to determine student perceptions of RBV based on three WebQual 4.0 quality dimensions, namely information quality, service interaction, and usability, and found that the usability dimension has a negative effect on student satisfaction.

Usability is one of the key factors for successful technology adoption [3] and the overall quality of software products. Furthermore, digital library usability, which refers broadly to user experience and satisfaction when using digital libraries, has been the focus of most research [4]. Usability is very important in attracting new users and has a direct influence on user satisfaction [5]. Poor usability will reduce the use of information systems and hinder the acceptance of information systems by users which will have a negative impact on the effectiveness and efficiency of information systems and will reduce user satisfaction [6], [7].

Various previous studies related to usability testing on various information system applications have been carried out. For example testing on hospital applications [8], [9], e-commerce [10], [11], mobile applications [12], [13], [14], [15], banking applications [16], [17], [18] and various other fields.

However, as far as literature studies have been conducted, research on usability testing in RBV has never been carried out. Usability testing is a very important field that helps an application to be useful and easy to use by users [19].

Therefore, this study seeks to fill this void by carrying out usability testing of RBV to know student perceptions of RBV. Usability testing of RBV was carried out using the questionnaire method using the System Usability Scale (SUS) instrument. SUS is one of the most popular and easy-to-use questionnaires to measure the usability level of any product [20].

This research is organized into four parts. The second part describes the research method. The analysis and results are discussed in the fourth section. Finally, the fifth part is the conclusion of the research.

Methodology

This study used the System Usability Scale (SUS) as the main instrument to evaluate the usability of RBV. SUS was chosen due to its simplicity and efficiency in measuring perceived usability, as well as its wide acceptance across various application domains.

The System Usability Scale (SUS) is a reliable tool for measuring the usability of a system, which can include hardware, software, mobile devices, websites, and applications [21]. It consists of a 10-item questionnaire with five response options for respondents, ranging from "Strongly agree" to "Strongly disagree." Developed by John Brooke in 1986, the SUS is a quick and cost-effective method that provides a global view of subjective assessments of usability [22].

To calculate the SUS score, each question's score is first converted to a new number. For odd-numbered questions, subtract one from the user's score. For even-numbered questions, subtract the user's score from five. Then, sum all these new values and multiply by 2.5 to convert the original scores of 0-40 to 0-100. These scores are not percentages but should be considered in terms of their percentile ranking. A SUS score above 68 is considered above average, and anything below 68 is below average. The SUS provides a single number that reflects a composite measure of the overall usability of the system being evaluated [23], [24].

The first step taken was to prepare research instruments. The research instrument used in the study was adopted from Sharfina and Santoso's research [26]. The table of research instruments is illustrated in Table 1.

Table 1. Item in SUS

No.	Item in SUS
1	I think that I would like to use this system frequently.
2	I found the system unnecessarily complex.
3	I thought the system was easy to use.
4	I think that I would need the support of a technical person to be able to use this system.
5	I found the various functions in this system were well integrated.
6	I thought there was too much inconsistency in this system.
7	I would imagine that most people would learn to use this system very quickly.
8	I found the system very cumbersome to use.
9	I felt very confident using the system.
10	I needed to learn a lot of things before I could get going with this system.

After the research instruments were completed, the instruments were distributed to respondents. Respondents in this study were engineering students majoring in information systems at Universitas Terbuka undergraduate study program. The population in this study was 70 students. The number of samples used in this study amounted to 32 respondents. Details of research respondents can be seen in Table 2.

Table 2. Research respondents' details

PS 2022.1	Semester	Total Students	Study Group	Subjects
SI CSR6	6	24	JENEPONTO	MSIM4315/Data Warehouse
SI BM6	6	24	MAKASSAR	MSIM4315/Data Warehouse
SI CSR4	4	22	BULUKUMBA	MSIM4207/System Information Management

After the questionnaire data has been collected, the results of the data must be analyzed to give meaning to the results that have been obtained. The questionnaire data must go through various stages, starting from data entry into the computer, testing validity and reliability, and descriptive analysis.

One aspect of the descriptive analysis was evaluating the usability of the system using SUS. SUS provides a reliable metric for evaluating the usability of a product or system (Bangor et al., 2008). The SUS yields a score on a scale from 0 to 100, where higher scores indicate better usability. To interpret the SUS scores obtained in this study, the acceptability ranges and adjective ratings proposed by Bangor et al. (2008) were used as guidelines (Figure 1).

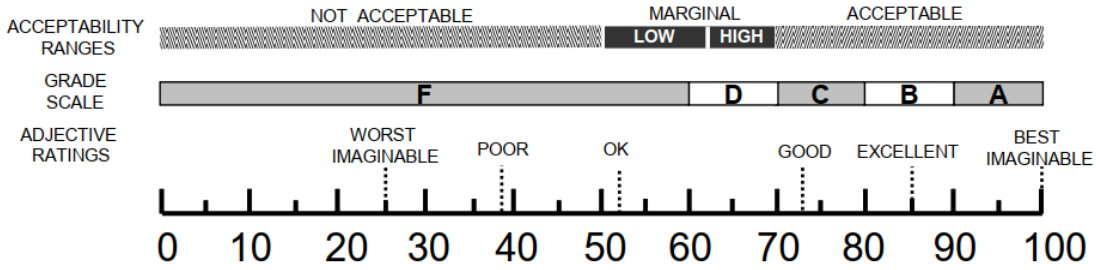

Figure 1. The score of System Usability Score (SUS)

Figure 1 shows the interpretation of the SUS score. The acceptability ranges guide how to categorize the level of system usability based on the SUS score obtained. A SUS score above 68 is considered above average usability and in the "acceptable" range. Scores below 68 are interpreted as below average or unacceptable usability.

In addition to the acceptability ranges, the grade scale maps the SUS scores to letter grades from A to F. This grading scale allows for ranking the usability level, with A being the highest pass level indicating excellent usability, and F being the lowest failing grade, indicating awful usability. Finally, the adjective ratings provide descriptive labels corresponding to different SUS score ranges to qualitatively rate the usability level. The adjective ratings are: Best Imaginable, Excellent, Good, Ok, Poor, and Worst Imaginable.

Results and Discussions

Respondents who were used as samples in this study totaled 32 people, dominated by 75% (24 people) of female respondents, and 25% (8 people) of male respondents with an average age of respondents was 21 years.

Prior to statistical analysis, the items of the absolute questions are to be tested for validity and reliability. With SPSS, validity and reliability can be done simultaneously in one way. The validity test results are presented graphically in Figure 2.

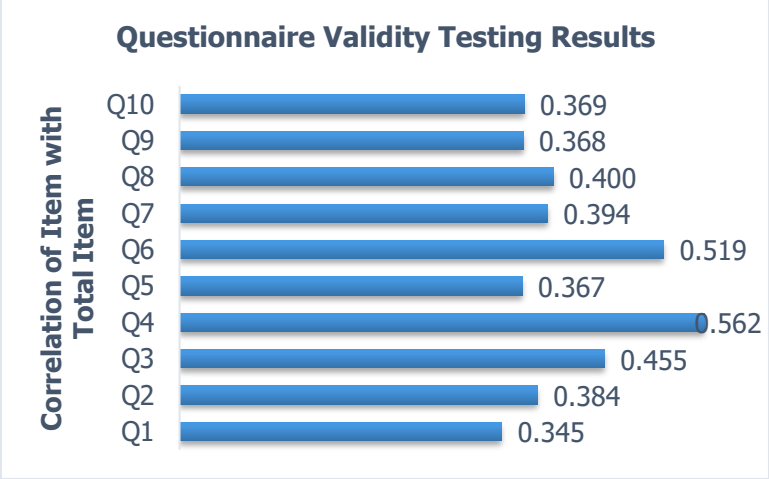

Figure 2. Questionnaire validity test results

The validity of the questionnaire items was evaluated by calculating the item-total correlations. The item-total correlation for a given item indicates the extent to which scores on that item correlate with the total scores across all other items in the scale [27]. It is calculated by first obtaining the total score for each respondent by summing their responses across all items. Next, for each item, the corrected total score is calculated for each respondent by subtracting their score on that specific item from their total score. The item score is then correlated with the corrected total scores across all respondents [28]. A higher item-total correlation signifies that the item is a valid measure of the same underlying construct as the overall scale [29]. To assess validity, the calculated item-total correlations were compared against established minimum criteria, commonly set at 0.3 or higher [30]. Figure 2 shows whether the item questions have good content validity or not. Items failing to meet these criteria were considered for revision or removal from the scale, as low item-total correlations suggest the item may not adequately capture the intended construct. If you pay attention, all question items have item correlation values with a total item above 0.3, meaning that all question items are declared valid.

Table 3. Questionnaire reliability test results

Cronbach's Alpha	N
.665	10

Table 3 is a table showing the reliability value. The reliability of the questionnaire was assessed by calculating Cronbach's alpha coefficient. Cronbach's alpha is a measure of internal consistency reliability that estimates how consistently individuals respond to the items within a scale [31]. It is based on the average inter-item correlation, with higher values indicating greater reliability [28]. Specifically, Cronbach's alpha values of 0.6 or higher are generally considered acceptable for establishing the internal consistency of a scale [32].

As shown in Table 3, the Cronbach's alpha value obtained for the 10-item questionnaire was 0.665. This result falls within the acceptable range, demonstrating that the items in the questionnaire have satisfactory internal consistency reliability.

The usability level of RBV was measured using a research instrument by adapting the Indonesian version of SUS questionnaire [26], designed on a 5-point Likert scale with a score of 1 for the answer criteria Strongly Disagree to a score of 5 for the answer criteria Strongly Agree.

Table 4 shows the data obtained from the usability questionnaire of RBV using the SUS architecture. The data table consists of columns of respondents worth 1–32 respondents.

Table 4. Data generated from the SUS questionnaire

No	Respondents	Actual Score										SUS
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	
1	Respondents 1	5	4	5	5	5	5	5	5	5	5	52,50
2	Respondents 2	5	4	4	3	5	2	3	1	3	4	65,00
3	Respondents 3	5	2	5	3	4	2	3	2	4	4	70,00
4	Respondents 4	5	2	5	2	5	2	4	2	4	2	82,50
5	Respondents 5	5	1	5	5	5	1	5	1	5	5	80,00
6	Respondents 6	4	2	4	1	4	5	3	2	5	3	67,50
7	Respondents 7	4	2	4	4	4	4	4	3	4	4	57,50
8	Respondents 8	4	1	4	2	4	3	5	1	5	4	77,50
9	Respondents 9	5	5	5	3	4	2	5	2	5	5	67,50
10	Respondents 10	4	2	5	3	5	5	5	2	5	5	67,50
11	Respondents 11	5	1	5	5	5	1	5	1	5	1	90,00
12	Respondents 12	4	3	3	3	4	3	4	2	4	4	60,00
13	Respondents 13	4	1	4	2	5	1	4	1	4	5	77,50
14	Respondents 14	4	3	3	2	1	5	3	1	1	5	40,00
15	Respondents 15	5	1	4	2	5	5	5	1	5	5	75,00
16	Respondents 16	5	4	3	1	4	4	3	4	2	5	47,50
17	Respondents 17	5	2	5	1	4	1	4	2	4	2	85,00
18	Respondents 18	5	2	4	2	5	1	5	1	5	3	87,50
19	Respondents 19	4	3	3	3	4	2	4	3	2	4	55,00
20	Respondents 20	5	2	5	1	5	2	5	1	5	3	90,00
21	Respondents 21	5	2	5	2	5	4	5	1	5	4	80,00
22	Respondents 22	5	1	5	1	5	1	5	1	5	1	100,00
23	Respondents 23	5	1	5	1	5	1	4	1	5	2	95,00
24	Respondents 24	5	1	5	1	5	1	5	1	5	5	90,00
25	Respondents 25	5	2	5	1	5	3	5	1	1	1	82,50
26	Respondents 26	5	4	4	2	4	2	5	1	5	1	82,50
27	Respondents 27	5	1	5	3	5	1	5	1	5	3	90,00
28	Respondents 28	5	3	2	2	5	1	3	2	3	5	62,50
29	Respondents 29	5	5	4	4	5	5	4	2	3	4	52,50
30	Respondents 30	3	2	2	4	3	2	2	3	2	5	40,00
31	Respondents 31	5	2	4	1	4	1	4	2	4	5	75,00
32	Respondents 32	4	2	5	1	3	1	4	1	5	4	80,00
	SUS AVERAGE SCORE											72,66

The score is based on the responses of students who have evaluated RBV. After calculating the 32 respondent's data into an assessment score, the next step is to calculate the average SUS assessment score from 32 respondents, namely 72.66.

Based on the information provided in Table 4 the average SUS score for RBV is 72.66, we can interpret these findings using the acceptability ranges, grade scale, and adjective ratings as follows.

A SUS score of 72.66 placed it in the "acceptable" range. This indicates that the usability of RBV is considered above average and acceptable. Referring to the grade scale, a SUS score of 72.66 corresponds to a grade of C. According to the adjective ratings, a SUS score between 68-

80.3 is described as "Good" usability. Since 72.66 lies within this range, the usability of RBV can be rated as "Good".

Therefore, based on the acceptability ranges, grade scale, and adjective ratings, the findings suggest that RBV has an acceptable level of usability, a grade of C on the usability scale, which is an average/median grade, and an adjective rating of "Good" usability, describing it as a system with satisfactory and above-average usability.

Conclusion

A SUS score of 72.66 places RBV in the "acceptable" range. This indicates that the usability of RBV is considered above average and acceptable. Referring to the grade scale, a SUS score of 72.66 corresponds to a grade of C. According to the adjective ratings, a SUS score between 68-80.3 is described as "Good" usability. Since 72.66 lies within this range, the usability of RBV can be rated as "Good".

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